# Health Hazards of Air Pollution and Prevention Efforts

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## Overview of presentation

- How EPA sets standards
- NAAQS for ozone
- NAAQS for PM
- Air Quality Index
- Roles of State and local air agencies and EPA in AQI forecasting and reporting
- EPA products

## Anatomy of Air Quality Standards

- Standards
  - Based on the latest scientific criteria
  - Protect public health with an adequate margin of safety, and protect against adverse effects on public welfare
- Four major components
  - Indicator: e.g., TSP, $PM_{10}$, $PM_{2.5}$
  - Averaging Time: e.g., 1-hr, 24-hr, annual avg.
  - Form: e.g., x exceedances, percentile, mean
  - Level: e.g., 15 $\mu g/m^3$
- Degree of protection afforded by suite of air quality standards is a function of all of the above

## Review Process for NAAQS

- Scientific studies on health and environmental effects - Scientific peer review of published studies
- EPA criteria documents - Reviews by CASAC and public comments
- EPA staff paper interprets scientific data and identifies factors to consider in setting standards including staff recommendations for standards - Reviews by CASAC and public comments
  - Proposed decision on standards

- Public hearing and comments on proposals
- Final decision on standards

## Public Health Risks Are Significant

**Ozone is linked to:**

- Aggravation of lung diseases
  - Hospital admissions
  - Doctor and ER visits
  - Medication use
  - School and work absences
- And possibly to:
  - Development of asthma
  - Premature mortality

**Ozone Irritates Airways**

- Symptoms
  - Cough
  - Sore or scratchy throat
  - Pain with deep breath
  - Fatigue
- Rapid onset
- Similar symptoms - people with and without asthma

**Ozone Reduces Lung Function**

**Ozone Causes Inflammation**

- Ozone reacts in surface layer
- Influx of white blood cells
- Damages cells that line airways
- Effect is greater 24 hours after exposure
- Increases airway reactivity
- Increased susceptibility to lung infections
- Concern about repeated exposures

## Groups at greater risk from ozone

- Children and adults who are active outdoors
  - More likely to be exposed
- People with lung diseases, such as asthma
  - Diseases make them vulnerable

- People who are unusually sensitive to ozone

## 1997 Ozone NAAQS

- Health and welfare standards the same
  - 0.08 ppm $O_3$, 8-hour average
  - $4^{th}$ maximum concentration
  - Averaged over 3 years
- New review in early phase

## Public Health Risks Are Significant

**Particle pollution is linked to:**

- Premature death from heart and lung diseases
- Aggravation of heart and lung diseases
  - Hospital admissions
  - Doctor and ER visits
  - Medication use
  - School and work absences

## Groups at greater risk from PM

- People with heart or lung diseases
  - Diseases make them vulnerable
  - May include people with diabetes
- Older adults
  - May have undiagnosed diseases
- Children
  - Bodies still developing
  - Breathe more per lb
  - More active

## 1997 PM NAAQS

- Current standards:
  - $PM_{2.5}$ standards
    - 15 µg/$m^3$ annual
    - 65 µg/$m^3$ 24-hour
  - $PM_{10}$ standards
- First draft Staff Paper:
  - $PM_{2.5}$ standards
    - Range 12-15 µg/$m^3$ annual

- Range 30-50 µg/$m^3$ 24-hour

– Consider new standards for coarse fraction particles ($PM_{10-2.5}$)

## Air Quality Index

### Use AQI to Reduce Risk

Dose = Concentration x Ventilation Rate x Time

– Reduce concentration – schedule activities when pollution levels lower
– Reduce ventilation rate by taking it easier
– Reduce time spent in vigorous outdoor activities

- Pay attention to symptoms
- People with asthma – follow asthma action plan
- Coaches – rotate players frequently, plan easy practices

## Challenge we faced

- Successful ozone Air Quality Index (AQI) program
- Add particulate matter
- Reach sensitive groups
- Promote exercise and outdoor activities
- What does the public want to know, and how do they want to get that information?

## Health Advisories Make A Difference

- Roper 2002 "Green Gauge Poll"
  – Survey of 2000 people across the US
  – 52% have heard of "Code Orange" or "Code Red" air quality days
  – Of those, 46% have reduced exposure to air pollution
- UCLA – Neidell et al.
  – 4 to 7% reduction in pediatric hospital admissions for asthma attributable to advisories

## An Hour in the Life of an AIRNow Ozone Molecule

The journey begins…..
First stop: AQ Agency
All roads lead to the DMC…
Stats:

- Redundant computer servers
- Files processed in seconds
- Over 30,000 data values per day

- 50 maps produced every hour

The last leg of the journey is through weather and news providers to the public

**Media coverage**

## Website: Air Quality Index (AQI) – epa.gov/airnow

- Air Quality Forecasts
- Ozone map
- Smoke brochure and Web page

## Tools

Web Course for Health Care Providers
Web-based fact sheet for physicians
Medical poster

## Air quality broadcasts

- Air Pollution Distance Learning Network (APDLN) – State and local public health officials (satellite)
- The Weather Channel "Project Earth" – air pollution forecasting for public (TV and Web site)

## Information Products

- Air Quality Index – A Guide to Air Quality and Your Health
- Ozone and Your Health
- Smog – Who Does It Hurt?
- Air Quality Guide for Particulate Matter
- Particle Pollution and Your Health
- At-a-glance messages for meteorologists

## What's ahead for AQI/AIRNow?

- National e-alert system
- Outreach to public health professionals
  - Cardiologists
  - Family practice doctors
- Web portal for State/local forecasters
- Quick response capability
- AQI map on AIRNow